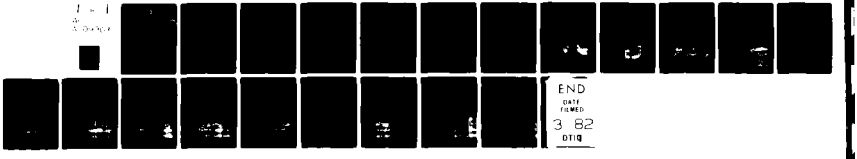
AD-A109 903 NAVAL MINE ENGINEERING FACILITY YORKTOWN VA F/G 17/1
DUKANE SONAR TRANSMITTER MODEL N15F2108; EVALUATION OF,(U)
JUL 76 G J PENNINGTON
UNCLASSIFIED NAVMINENGRFAC/TE-9-75 NL



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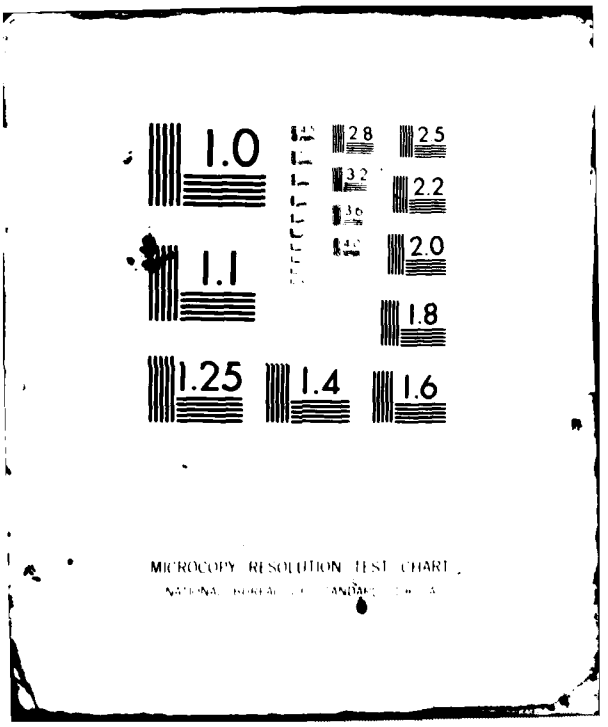
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MICROCOPY RESOLUTION TEST CHART

Naval Sea Systems Command
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NAVAL MINE ENGINEERING FACILITY Report

LEVEL II

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9 July 1976

NAVMINENGRFAC/TE-9-75

Subj: Dukane Sonar Transmitter Model N15F210B; evaluation of

Ref: (a) COMINEWARFOR ltr N33 8550 ser 0533 of 3 Apr 1975 to NAVSEASYSCOM

Encl: (1) Official U. S. Navy Photograph DHM 5908-2 of 24 Jun 1975
(2) Official U. S. Navy Photograph DHM 5908-1 of 7 Jul 1975
(3) Official U. S. Navy Photograph DHM 6075-1 of 14 Aug 1975
(4) Official U. S. Navy Photograph DHM 6075-2 of 14 Aug 1975
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(6) Official U. S. Navy Photograph DHM 6066-3 of 20 Aug 1975
(7) Official U. S. Navy Photograph DHM 6080-4 of 29 Aug 1975
(8) Official U. S. Navy Photograph DHM 6080-3 of 29 Aug 1975
(9) Official U. S. Navy Photograph DHM 6080-1 of 29 Aug 1975
(10) Official U. S. Navy Photograph DHM 6080-2 of 29 Aug 1975
(11) Official U. S. Navy Photograph DHM 6203-5 of 23 Oct 1975
(12) Official U. S. Navy Photograph DHM 6097-4 of 8 Sep 1975
(13) Official U. S. Navy Photograph DHM 6097-3 of 8 Sep 1975
(14) Official U. S. Navy Photograph DHM 6097-2 of 8 Sep 1975

1. BACKGROUND

A. Reference (a) requested that support for use of mine instrumentation, including the Sonar Transmitter Mk 62, be continued in all Fleet Service Mine Test (FSMT) exercises and extended to non-service mine plants. This request for additional support imposed a greater demand on our stocks of Sonar Transmitter Mk 62. During routine screening/overhaul of the stocks of Sonar Transmitter Mk 62 at the WPNSTA Yorktown to obtain serviceable units, it was discovered that the gold plated silver leads which connects the crystal in the transmitter to the circuit were in varying degrees of deterioration. An analysis of the deteriorated crystal leads in the Sonar Transmitter Mk 62 revealed that the degradation was due to silver sulfide formation. It has been determined that this silver sulfide formation was inherent in the design of the transmitter. Therefore, degradation of the crystal leads in the transmitter was unavoidable and could only be eliminated by a major redesign.

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Corrosion study of Aluminum Sonar Transmitter Beacon

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

A corrosive study was conducted at Naval Weapons Station Yorktown. Two aluminum Transmitters Dukane Model N15F210B were subjected to a 30-day sea water immersion test. Results of the test are presented. The degree of corrosion is analized as it would affect reusability of the transmitter.

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B. The Facility had just completed an evaluation of Dukane Acoustic Beacon, Model N15M210, (stainless steel cased sonar transmitter) for an FSMT Destructor DST 36/40 with very favorable results. Since the Sonar Transmitter Mk 62 was experiencing these degradation problems and the Dukane transmitter looked so promising, the Facility decided to phase out the Sonar Transmitter Mk 62 and further investigate and evaluate commercial transmitters as a replacement. One major disadvantage of the Dukane Transmitter Model N15M210 was cost. Investigation revealed that the Dukane Acoustic Beacon Model N15F210B (aluminum cased sonar transmitter) cost about 30% less than the Dukane Model N15M210 and was identical except the case was made of aluminum. This report documents the results of an evaluation to determine the corrosion resistance and reusability of the Dukane Transmitter Model N15F210B when exposed to sea water. The three transmitters discussed above are shown on enclosure (1).

II. BRIEF

A. A preliminary corrosive study was conducted on two Dukane Acoustic Beacon (Sonar Transmitter) Model N15F210B. The transmitters were subjected to a 30-day sea water immersion test. The test was conducted in 18 feet of sea water adjacent to a floating dock at the WPNSTA Yorktown pier.

B. Results of the sea water immersion test indicate that the aluminum case of the Transmitter Model N15F210B would deteriorate in 30 days to such a degree that it would be considered unserviceable for a reusable item in a FSMT exercise.

III. DISCUSSION

A. Except for its case, the Dukane Acoustic Beacon Model N15F210B is identical to the Dukane Acoustic Beacon Model N15M210 which is currently being specified for use on FSMT Destructors DST 36/40. The Transmitter Model N15F210B is a rugged, self-contained battery powered device which activates automatically immediately upon immersion in water. It transmits an interrupted signal within the range of 35 to 43 KHz and is capable of transmitting an underwater signal in excess of 2000 yards. Its battery powered source is sufficient to operate the transmitter for 30 days. Its aluminum case is about 4 inches long and 1.3 inches in diameter which is slightly larger than the stainless steel case of the Transmitter Model N15M210.

B. The Transmitter Model N15F210B was scheduled for a series of tests programmed to simulate the endurance of ten 30-day FSMT/Non-Service Mine cycles. The test would extend over an 11-month period and employ 20 transmitters and 120 replacement batteries. It was anticipated that the tests would supply sufficient data to determine if the Dukane Acoustic Beacon Model N15F210B can meet the standards set by the Sonar Transmitter Mk 62. However, prior to procuring the transmitters and ancillary hardware

for testing the corrosive resistance and reusability of the aluminum case transmitter, a preliminary 30-day corrosive test was conducted on two Transmitters Model N15F210B which were provided by Dukane at no cost to the Government.

C. The two Transmitters Model N15F210B were tested in sea water adjacent to a floating dock at the WPNSTA Yorktown pier. Since the aluminum case of the Transmitter Model N15F210B was slightly larger than the stainless steel case of the Transmitter Model N15M210, the stainless steel bracket, which is currently specified for securing the Transmitter N15M210 to the FSMT Destructors DST 36/40, could not be used. Therefore, the transmitters were secured to mine tail covers, using Dukane's standard mounting brackets. One transmitter was secured with a one-piece aluminum bracket, while the other transmitter was secured with a set of stainless steel brackets. The two types of brackets are shown on enclosure (2). The two transmitters/tail cover, secured with nylon line, were manually lowered to the maximum depth of the test site. During the test, the average depth of the water was 18 feet, the average water temperature was 81°F and the average salinity of the water was 1.020 PPM. The transmitters were checked for audible output and visually inspected each week.

D. The two Transmitters Model N15F210B were operating satisfactorily at the end of the 30-day test. However, the aluminum cases were deteriorating rapidly. Enclosures (3) thru (14) depict the various degree of corrosion during the 30-day test. Events and details of the photographs are given below.

1. Enclosures (3) and (4) show the transmitters at 15 days in sea water. Enclosure (3) depicts the aluminum bracket acting as a sacrificial metal while the transmitter's aluminum case shows very little effect from sea growth and galvanic action. Enclosure (4) depicts little or no corrosion from galvanic action on the stainless steel mounting brackets while the transmitter's case shows a high degree of corrosion.

2. Enclosures (5) and (6) show the transmitter at 21 days in salt water. Enclosure (5) shows that the corrosion is increasing rapidly on the aluminum bracket. Enclosure (6) shows that the stainless steel mounting brackets are still resisting the corrosion, but the transmitter's aluminum case depicts a high degree of corrosion.

3. Enclosures (7), (8), (9), and (10) show the transmitters after being exposed to sea water for 30 days. Enclosures (7) and (9) depict that the majority of the galvanic action was on the aluminum mounting bracket while enclosures (8) and (10) show that the majority of the galvanic action was upon the transmitter's aluminum case suggesting that the aluminum bracket was acting as a sacrificial anode for the transmitter.

(4) Enclosure (11) shows the aluminum and stainless steel brackets at the end of the 30-day sea water test and after being washed in fresh water and wiped dry. The stainless steel brackets were not damaged during the test, but the aluminum brackets were badly deteriorated. Enclosure (12) is a close-up view of the aluminum bracket which shows the pits caused by galvanic action.

(5) Enclosures (13) and (14) are close-up views of the two transmitters showing some of the pits that formed during the 30-day exposure to sea water. The corrosive damage ranged from surface discoloration to .050" deep pits. The minimum thickness of the case at the "O" ring surface was .062 inch, giving a safety margin in the wall thickness of only .012 inch. The numbered graduation given on the scales, shown on enclosures (13) and (14), are in centimeters.

IV. CONCLUSIONS

A. The Dukane Acoustic Beacon Model N15F210B will operate satisfactorily for 30 days in sea water.

B. The aluminum case of the Dukane Acoustic Beacon Model N15F210B will corrode and deteriorate in sea water to such a degree that they can only be used for one 30-day FSMT mine exercise. In other words they should not be considered as a reuse item for FSMT/Non-Service Mine Test.

C. The stainless steel brackets were not affected by the 30-day immersion in sea water test.

D. The aluminum brackets deteriorated very badly and should not be used for mounting sonar transmitters to mine cases.

E. The Dukane Acoustic Beacon Model N15M210 (stainless steel cased transmitters), although initially costing 30% more, would be a better investiment for FSMT/Non-Service Mines than the Dukane Acoustic Beacon Model N15F210B (aluminum cased transmitter).

V. RECOMMENDATIONS

A. It is recommended that:

1. Further testing of the Dukane Acoustic Beacon Mocel N152F210B, as a replacement for the sonar transmitter, be cancelled.

2. The Dukane Acoustic Beacon Model N15M210 be used as a replacement for the Sonar Transmitter Mk 62.

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3. The Dukane Acoustic Beacon Model N15M210 be evaluated for the purpose of determining the actual number of 30-day FSMT/Non-Service Mine exercises that can be expected from each transmitter.

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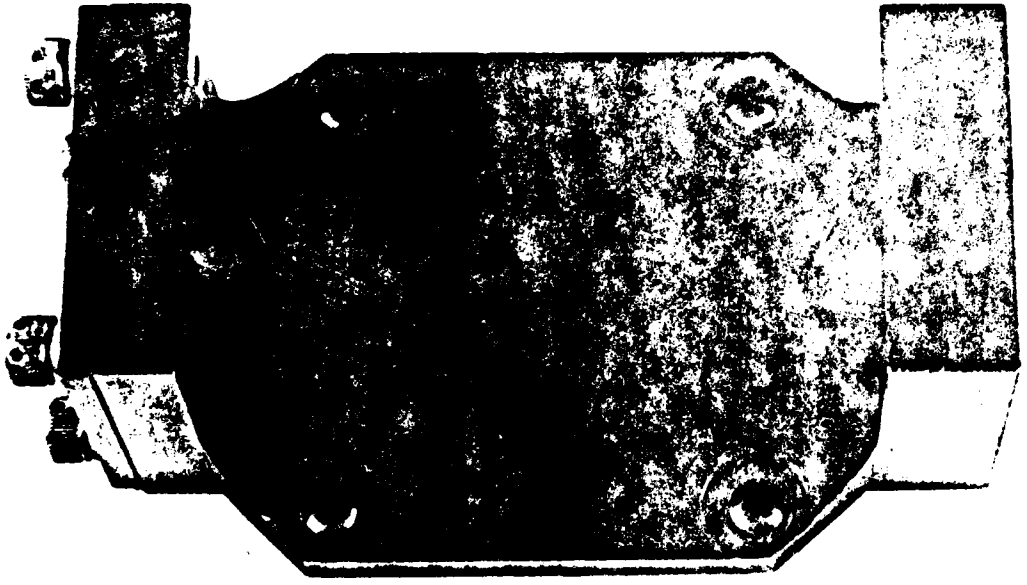
J. I. BROWN
Head, TE Department

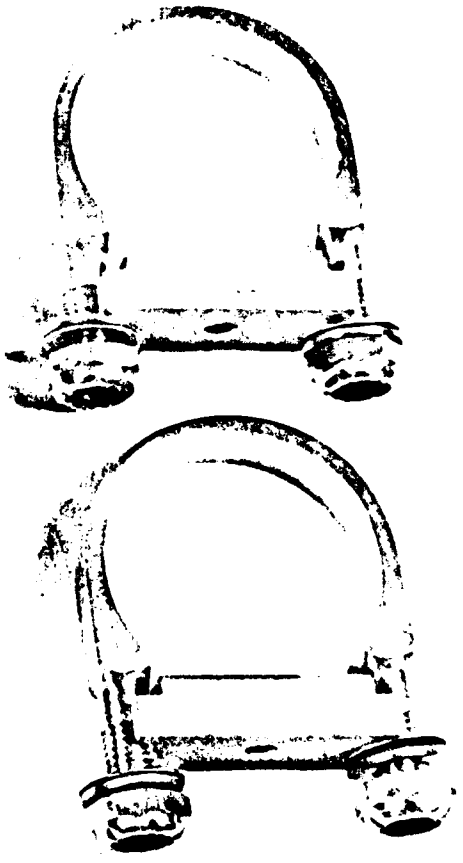
Approved by: _____
D. A. CLARK, Acting
Technical Director

LEFT VIEW - TRANSMITTER MK 62
UPPER RIGHT - TRANSMITTER MODEL N15M210
LOWER RIGHT - TRANSMITTER MODEL N15F210B

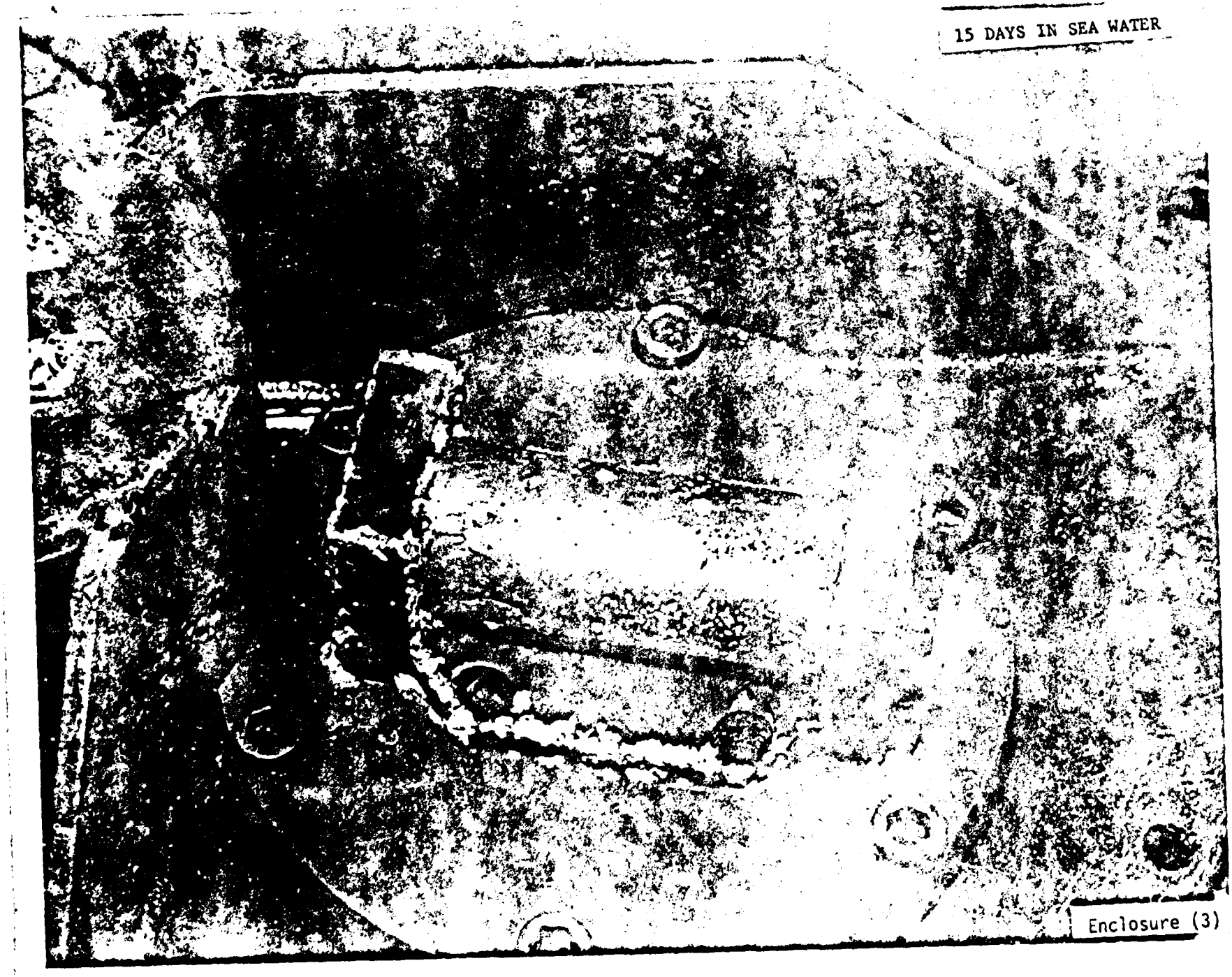
Enclosure (1)

DUKANE'S STANDARD MOUNTING BRACKETS
LEFT - ALUMINIUM BRACKET
RIGHT - STAINLESS STEEL BRACKETS



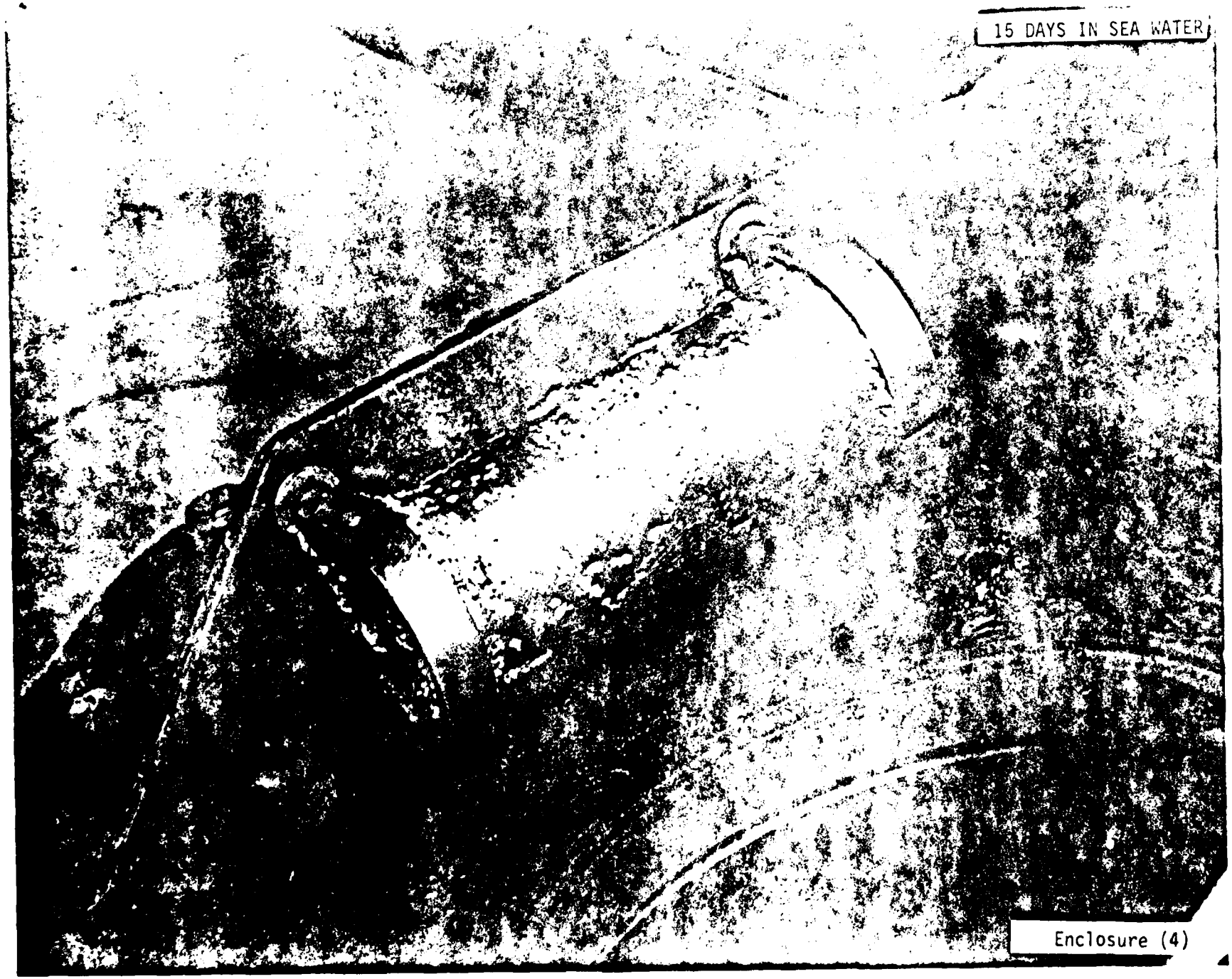


Enclosure (2)



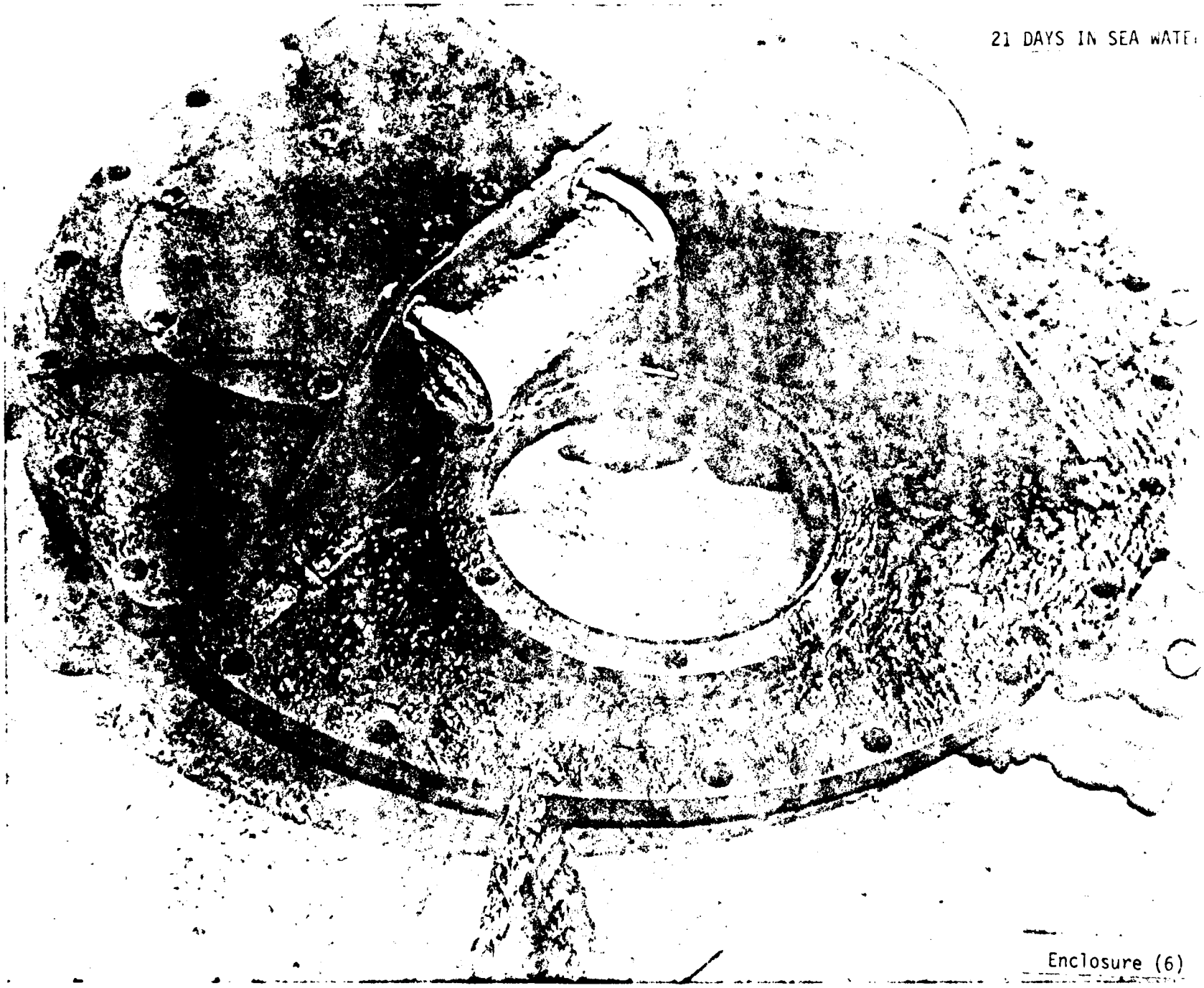
15 DAYS IN SEA WATER

Enclosure (3)



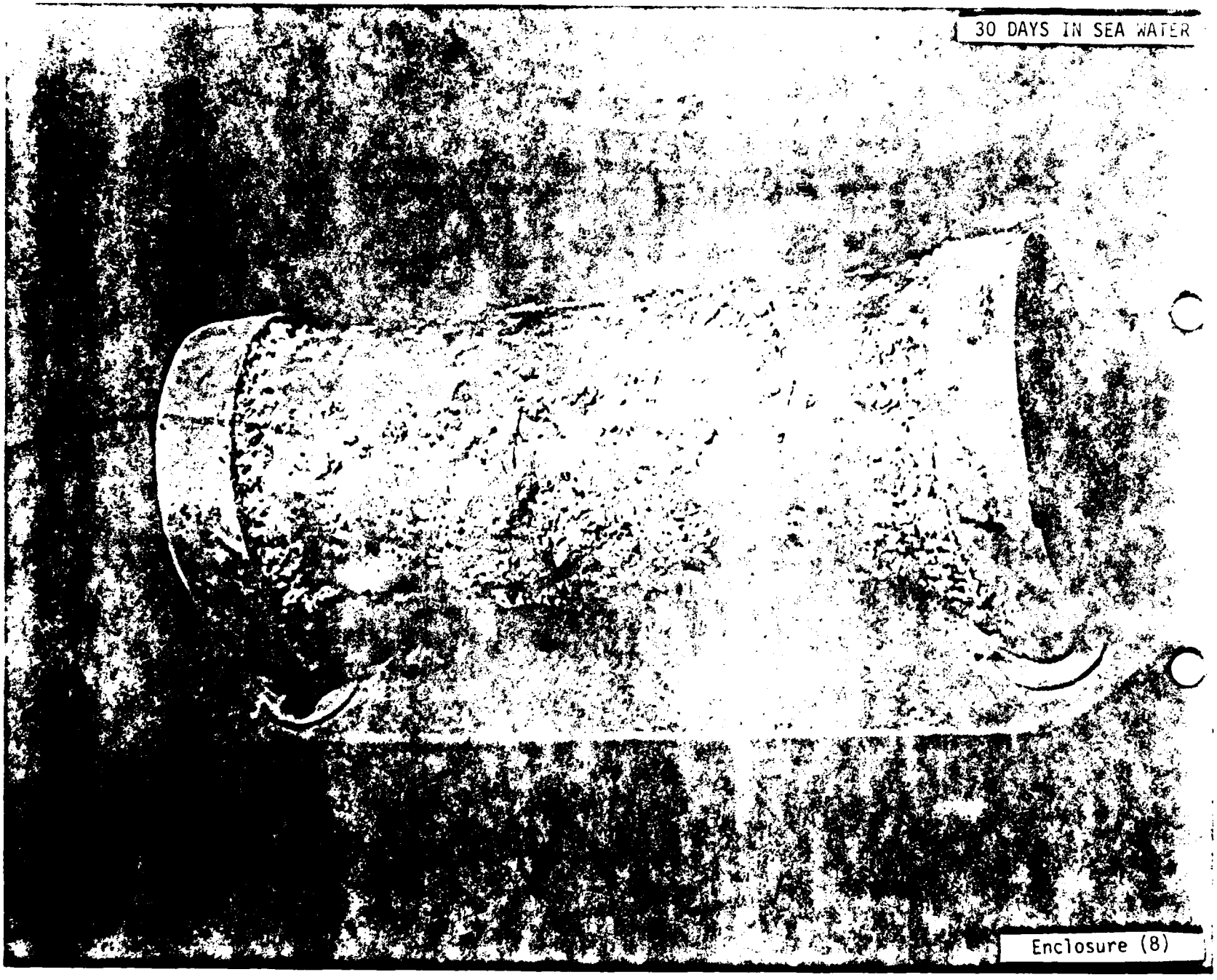
Enclosure (4)

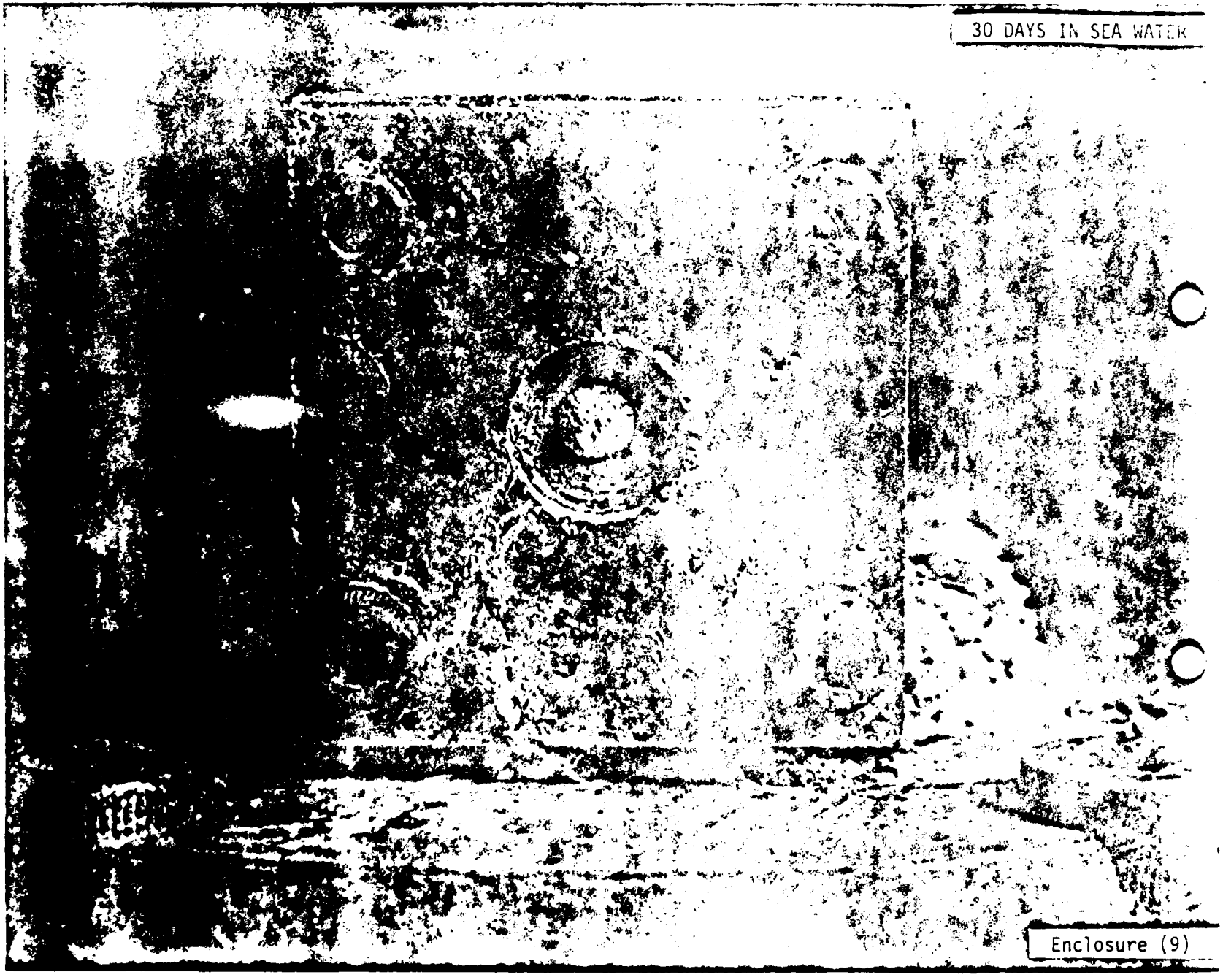
Enclosure (5

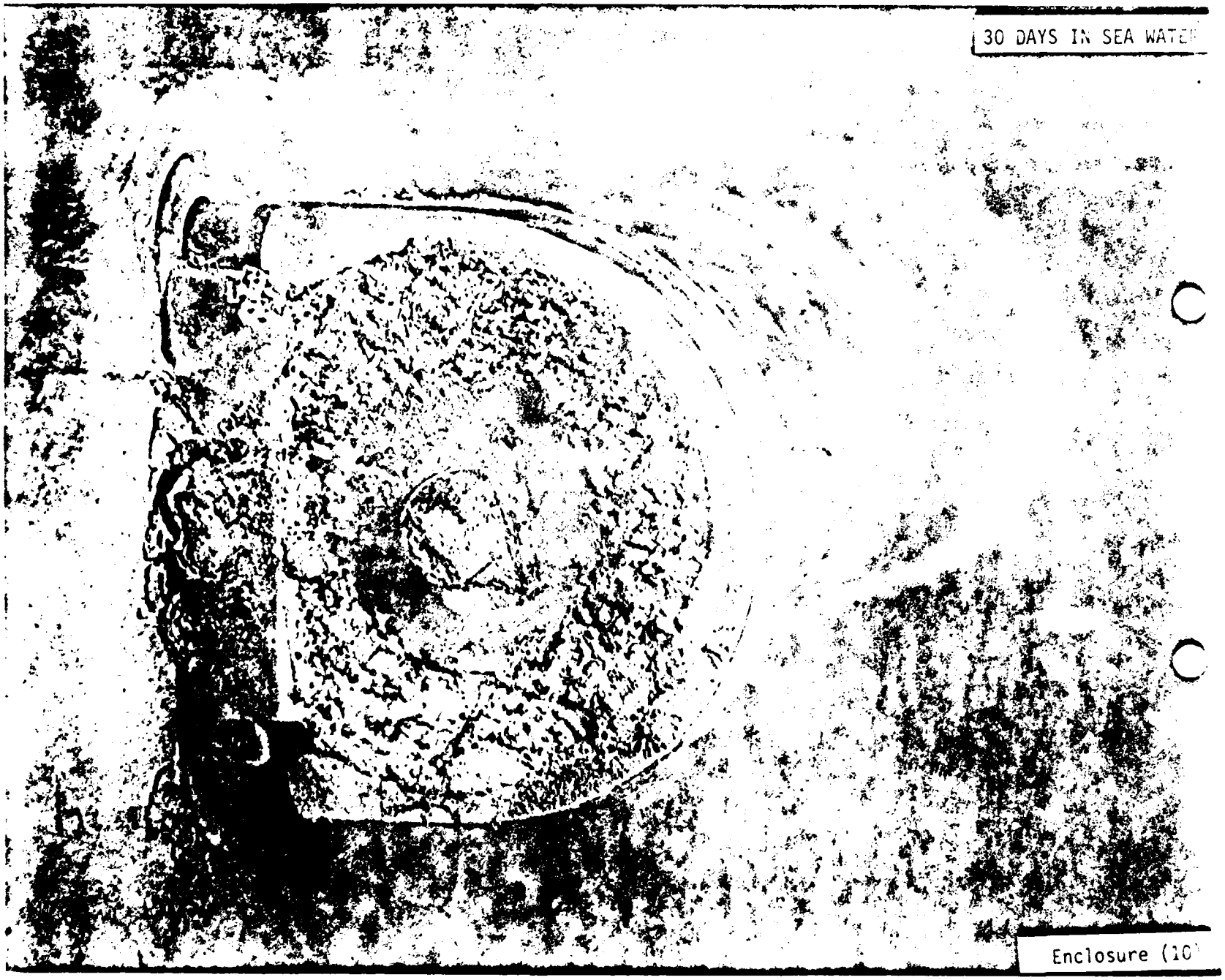


Enclosure (6)

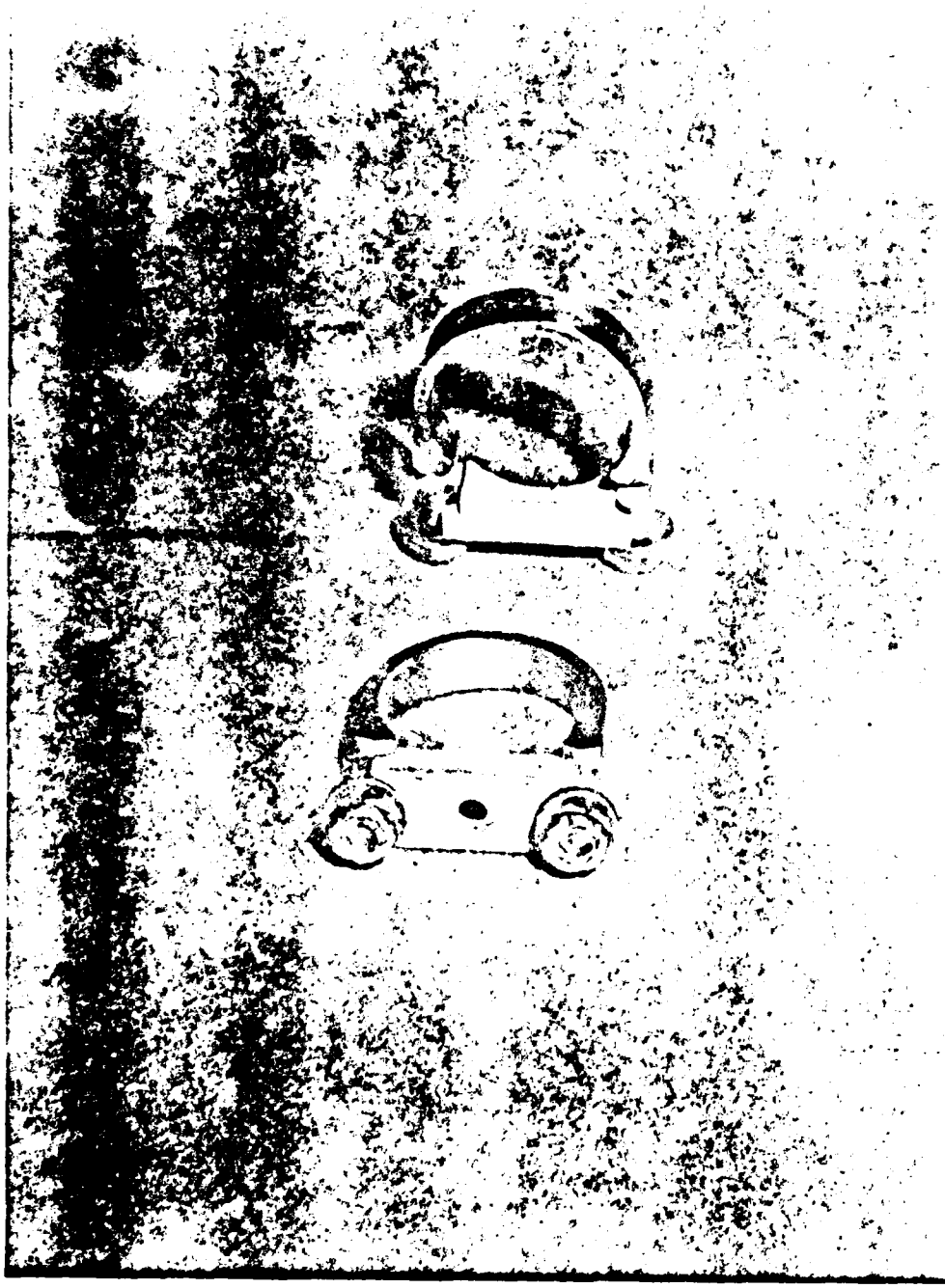

30 DAYS IN SEA WATER
Enclosure (7)


30 DAYS IN SEA WATER
Enclosure (8)

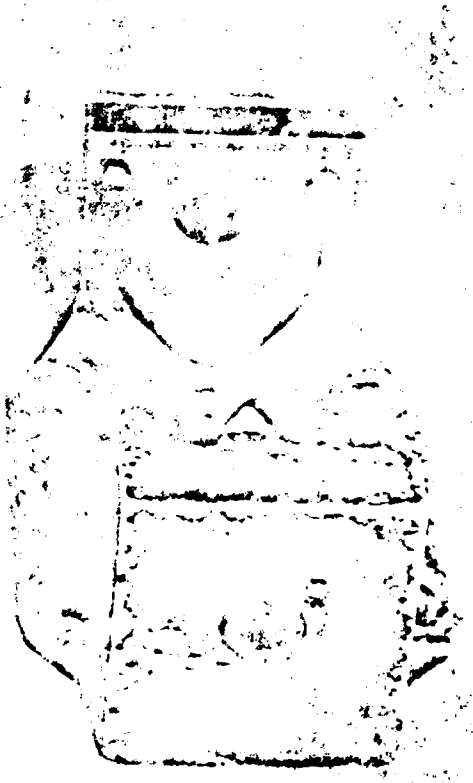

30 DAYS IN SEA WATER
Enclosure (9)



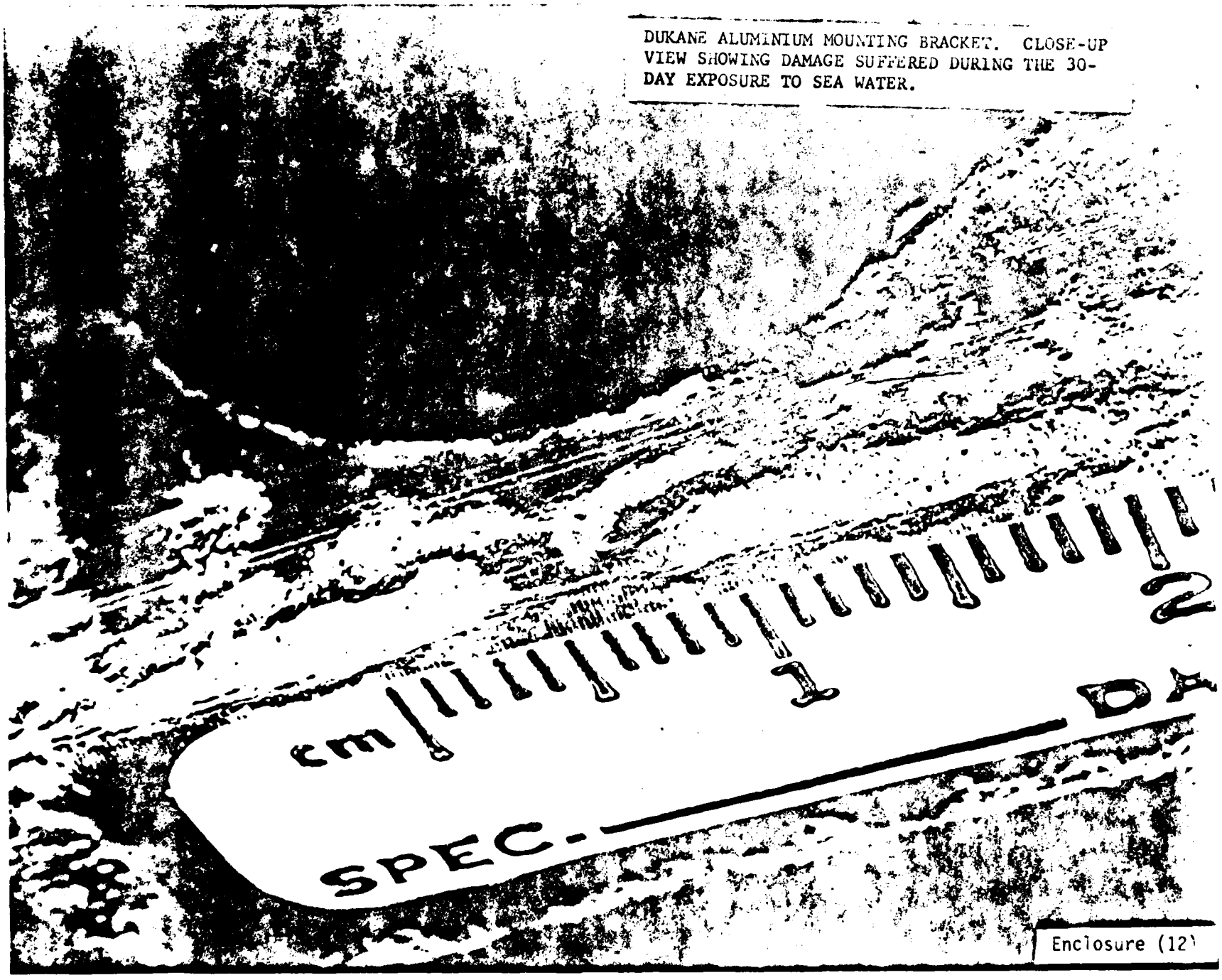
Enclosure (10)



BRACKETS WASHED IN FRESH WATER AFTER BEING EXPOSED TO SEA WATER FOR 30 DAYS.

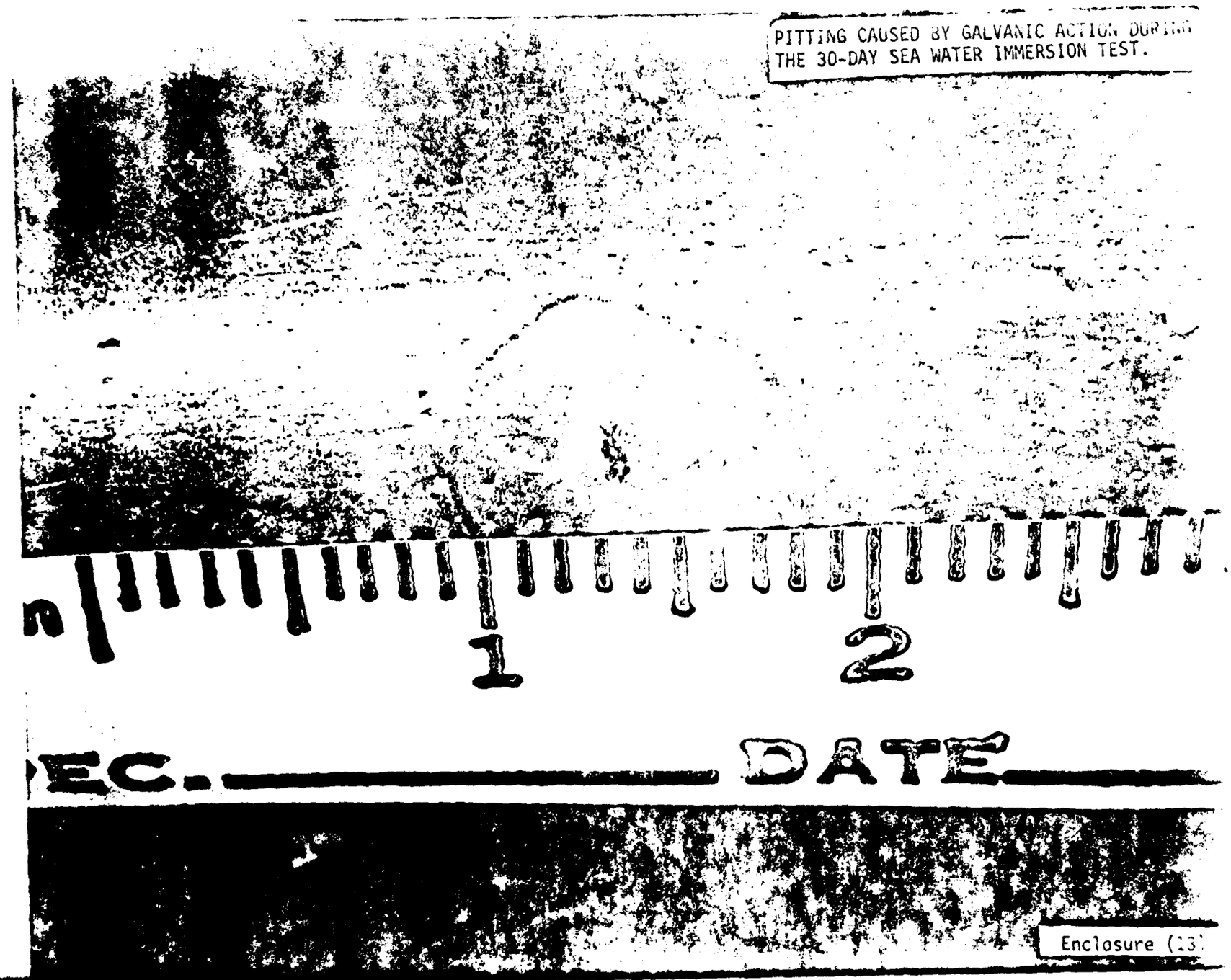


Enclosure (11)



DUKANE ALUMINIUM MOUNTING BRACKET. CLOSE-UP VIEW SHOWING DAMAGE SUFFERED DURING THE 30-DAY EXPOSURE TO SEA WATER.

Enclosure (12)



PITTING CAUSED BY GALVANIC ACTION DURING THE 30-DAY SEA WATER IMMERSION TEST.

PITTING CAUSED BY GALVANIC ACTION DURING THE 30-DAY SEA WATER IMMERSION TEST.